ROYAL COMMISSION
ON
AGRICULTURE IN INDIA

INTRODUCTION
TO
VOLUME VI

EVIDENCE
TAKEN IN
CENTRAL PROVINCES AND BERAR

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THE CENTRAL PROVINCES AND BERAR

1. GENERAL FEATURES AND NATURAL DIVISIONS.

The administrative area known as the Central Provinces and Berar is probably the most difficult to describe of all the provinces of India. The tracts comprising it differ widely from each other in circumstances, people and language, while each has its separate history. It has been well said that it was a veritable territorial puzzle that was pieced together in 1861 when the Central Provinces came into existence, and an administrative puzzle was added with the transfer to the same administration of Berar in 1903.

The combined provinces are situated in the centre of the Indian peninsula and comprise a large portion of the broad belt of hill and plateau country which separates the Deccan from the plains of Hindustan. The area of British territory is 82,109 square miles in the Central Provinces and 17,767 in Berar. The following account excludes the fifteen Indian States with an area of 31,176 square miles, within or bordered by British territory.

The combined provinces fall into five natural divisions. In the north-west, the districts of Saugor and Damoh lie on the Malwa plateau, rising sheer from the Narbada to a general elevation of from 1,500 to 3,000 feet. The surface of the country is undulating and broken by frequent low hills covered with a growth of poor and stunted forest.

South of this plateau comes the long and narrow valley of the Narbada, about two hundred miles long and twenty broad. The soil is alluvial deposit of extreme richness, excellently suited to the growth of wheat, but scoured by the numerous rapid streams pouring from the Satpura Hills to the Narbada.

The third division lies south of this valley, being composed of the Satpura Hills which stretch right across the province. The greater part consists of an elevated plateau, broken into volcanic hills, bare stony ridges, and narrow fertile valleys in which the soil has been deposited by drainage. The steep slopes to the plains on either side are traversed in all directions by narrow deep ravines covered with forest. The general elevation is 2,000 feet but several of the peaks rise to 3,500 and 4,000 feet. From this range of hills rise the Narbada and the Tapti rivers which flow westward into the Arabian Sea and the Wardha and Wainganga which flow eastward to join the Godavari.

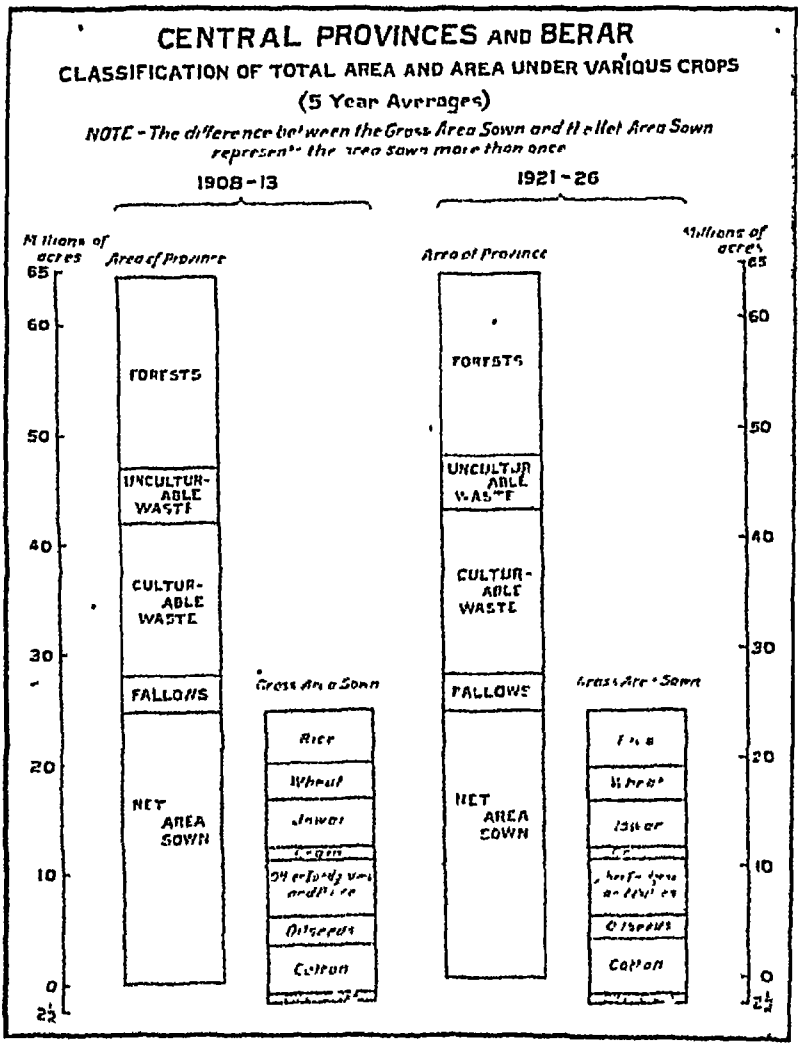
South of this range lies the great plain of Berar, Nagpur and Chhattisgarh. To the west is found the rich black soil which makes this the great cotton-growing tract of the province. Further east is an area of greater rainfall which is mainly rice-growing. It is distinguished by its numerous tanks for the irrigation of rice. Further east again, comes the open country of Chhattisgarh, almost treeless and divided between expanses of small embanked rice fields and ridges of unculturable laterite.

South again, lie two expanses of hill and plateau. To the west are the rugged hills of the Ajanta range rising in the Bombay Ghats, eastwards commences a vast area of hill and jungle; the dense forests and precipitous mountains and ravines formerly made an effective barrier to invasion or immigration and were shown in the old maps as the Great Wilderness. It has isolated stretches of culturable land, some of good quality and others, capable only of yielding the poorest rain crops, and all inefficiently cultivated and inhabited by primitive Ghonds and other forest tribes. Formerly the wildest and least known part of the whole peninsula, it is now being opened up in all directions by good roads.

Practically the whole of the Central Provinces lies in the catchment area of the rivers Narbada, Tapti, Godavari and Mahanadi, whose sources and catchment basins lie at a considerable height above sea level; owing to the rapid fall of level, they have cut out for themselves deep beds many feet below the surface of the country. In the rainy season, they become swift torrents; in the dry they dwindle to chains of almost stagnant pools.

The widespreading flows of volcanic rocks, known as the Deccan Trap, occupy nearly the whole of Berar and eight districts of the Central Provinces. Features of the trap area are the prevalence of long grass, the paucity of large trees, and the deciduous character of almost all the bushes and trees. The majority of the rivers are bounded by strips of alluvium. Manganese, coal, iron, bauxite, steatite, red ochre, limestone, and dolomite which makes excellent building stone are found.

Roughly speaking, four distinct kinds of agricultural land may be distinguished. The first is the heavy black soil which covers the Narbada Valley and the open and level portions of the Vindhyan and Satpura plateaux. It is either alluvial, formed by the deposit of decayed vegetable matter, through the agency of rivers and streams, or has resulted from the decomposition of trap or basalt rock, or from a combination of both agents. This land is suited to the growth of wheat, linseed, gram and other cold weather crops, which are dependent upon the moisture remaining in the ground from the monsoon rainfall and on the showers received during the months of December and January. Water is usually found only at a great depth from the surface, and irrigation is consequently little employed. Embankments to save erosion and hold up water and careful tillage are the main requisites for cultivation. The second class of land consists of shallow black soil, lying in a thin sheet over the surface of the basaltic rock from which it has been decomposed. It is suited for the growth of cotton, *juar* and other autumn crops requiring only light rainfall. The soil responds readily to manure and the application of industry largely increases the outturn. The third class of land includes the light sandy and stony uplands of the Vindhyan and Satpura ranges and the hilly country in the south where the soil is either very shallow or contains a large proportion of gravel mixed with boulders. Lands of this description are the poorest in the province; they require long resting fallows, and the cheap millets which they produce, constituting the main food grain of the aboriginal cultivators who raise them, are entirely dependent on the rainfall of August and September



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The last kind of land consists of yellow and sandy soil, formed from metamorphic or crystalline rock. It is the principal feature of the rice lands of the province, where the rainfall is heavy. This land, although of little natural fertility, responds readily to manure and irrigation.

In Berar, the soil in the valleys is a light brown alluvium, usually rich and suitable for wheat; the central valley contains a deep rich black loam, exceedingly fertile and often of great depth. The plateaux are covered with fairly rich soil.

The districts north of the Satpuras produce, principally, cold weather crops such as wheat and gram. Of those south of the Satpuras, the eastern ones produce principally rice and the western ones cotton and *jwar*. In the Satpura districts, the inferior soil is chiefly devoted to minor millets.

The climate of the more elevated and more northerly districts differs from the rest in that the mean temperature is lower, and the cold season is longer and more marked. The average rainfall in the Central Provinces is 48·5, and in Berar 32·3 inches. The highest rainfall is at Pachmarhi, where it amounts to 81·5 inches. Three-fourths of the annual total is received in the monsoon months of June, July and August, and a further nine to ten inches in September and October. Isolated falls may be received in November and December, while in January and February slight storms may occur, especially in the north.

2. PROVINCIAL INCOME

GOVERNMENT OF THE CENTRAL

(Figures are in

Revenue and Expenditure

Receipt Heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
Revenue Receipts						
Principal Heads of Revenue—						
Land Revenue ..	205	275	278	226	221	233
Excise ..	105	136	171	150	157	135
Stamps ..	50	78	67	68	71	71
Forests ..	41	47	51	72	50	71
Other heads ..	10	9	10	10	8	9
Irrigation	—	2	2	1	1	2
Debt Services—Interest ..	4	5	5	3	4	4
Civil Administration—						
Administration of Justice ..	6	5	5	6	7	6
Jails and Convict Settlements ..	3	3	3	4	4	4
Police	..	1	2	2	1	1
Education ..	3	4	4	5	5	5
Medical ..	..	1	1	1	1	1
Public Health ..	1	1	1	1	1	1
Agriculture (including Co-operation and Veterinary) ..	—	1	3	3	3	1
Industries	..	..	..	..	..	..
Other departments ..	—	..	1	1	..	1
Civil Works ..	3	4	5	4	5	5
Miscellaneous ..	8	11	11	12	9	8
Miscellaneous adjustments between Central and Provincial Governments	..	..	..	..	2	
Extraordinary receipts ..	..	..	..	..	..	1
[illegible]		[illegible]				
Total, Revenue Receipts ..	503	625	631	548	548	570

AND EXPENDITURE.

PROVINCES AND BERAR

lakhs of rupees)

charged to Revenue

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
Expenditure charged to Revenue						
Direct Demands on the Revenue—						
Land Revenue	38	45	46	24	25	27
Forests	28	30	31	33	35	40½
Other heads	12	12	15	12	25	22
Capital outlay on Forests charged to Revenue ..	..	..	..	..	2½	..
Irrigation—Revenue Account ..	21	22	24	26	25½	27½
Irrigation—Capital Account charged to Revenue ..	10	12	..	..	2	1½
Debt Services—Interest ..	4	4	3	2	2	..
Civil Administration—						
General Administration ..	60	60	48	68	60	70
Administration of Justice ..	31½	32	31	31	32	32½
Jails and Convict Settlements ..	11	9	10	9	9	10
Police	58	57	57	58	59	60
Education	49	54	49	50	53	62
Medical	13	14	14	12	14	17
Public Health	5	4	2½	3	5	4
Agriculture (including Co-operation and Veterinary) ..	14	13	14	15	16	16
Industries	3	6	3	2	3	3
Other departments	2	2	1	2	2	1
Civil Works	65½	67½	68	65	70½	102
Miscellaneous	72	60	77½	76	78	78½
Provincial contribution ..	31	22	22	22	13	22
Miscellaneous adjustments between Central and Provincial Governments	..	½	..	1	..	½
Extraordinary charges ..	..	..	..	..	..	..
Total, Expenditure charged to Revenue ..	527½	512	516	511	545½	597½

GOVERNMENT OF THE CENTRAL

(Figures are in

Capital Receipts

Receipt heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926 27
Capital Receipts						
Revenue Surplus	..	26	23	37	2½	..
Famine Insurance Fund ..	..	30	45	44	42	46
Appropriation for Reduction or Avoidance of Debt ..	.	.	1	2	..	..
Other appropriations ..	.	..	..	..	3	3
Loans and Advances by Provincial Government ..	37	57	33	23	12	7
Loans between Central and Provincial Governments ..	511	20	31	27	13	32
Total, Capital Receipts ..	548	148	133	133	72½	88
Opening Balance ..	–413	..	78	172	245	229
Total ..	135	148	211	305	317½	317

PROVINCES AND BERAR.

lakhs of rupees)

and Expenditure

Expenditure heads	1921-22	1922-23	1923-24	1924-25	1925-26	1926-27
Capital Expenditure						
Revenue Deficit	24	..	..	..	..	67
Famine Insurance Fund ..	..	5	4	3	4½	10
Loans and Advances by Provincial Governments	91	5	3	2	21	7
Loans between Central and Provincial Governments	5	42	6	28	25	8
Forest Capital Outlay	..	1	1	1	11	7½
Capital Outlay on Stationery and Printing	..	..	2	..	..	..
Construction of Irrigation Works..	15	17	23	26	27	26
Miscellaneous .. .	..	..	..	..	..	4½
Total, Capital Expenditure ..	135	70	39	60	88½	130
Closing Balance ..	..	78	172	245	229	187
Total ..	135	148	211	305	317½	317

3. REVENUE ADMINISTRATION AND LAND RECORDS.

The combined provinces are divided into five divisions, each under a Commissioner, and twenty-two districts, each under a Deputy Commissioner. The districts are divided again into tahsils, of which there are 83. Each tahsil is divided for purposes of land records into *patwari's* circles which comprise several villages, and are grouped into three or four revenue inspector's circles per tahsil. Revenue inspectors are supervised by assistant superintendents of land records under a district superintendent of land records who is under the Deputy Commissioner. The head of the Land Records Department is the Director who is also Commissioner of Settlements.

The Deputy Commissioner is the official head of his district, the district representatives of other departments being for the most part his advisers in matters concerning their departments, and corresponding through him, so that he watches over and co-ordinates all government activities in his district and safeguards the interests of the general public. He is, amongst other duties, in charge of the administration of revenue law and the maintenance of land records, and must give constant attention to the state of the crops, the economic condition of the people, the need for remissions or suspensions of land revenue and to any symptoms of approaching scarcity. The forests in his district are under his general control. He was formerly largely responsible for the maintenance and planning of roads, the spread of education, the general public health of the district, and the prevention and stamping out of cattle disease. But latterly these duties have been handed over to representative local bodies and his responsibilities have to this extent been reduced.

The organisation of a suitable land revenue system in the tracts which are now included in the combined provinces was a task of unusual difficulty. Prior to the advent of the British administration, the chief characteristic of the system, or lack of system, was the ruthless rackrenting which swept aside any existing rights and customs which stood in the way of the demand of the rulers of the time. Villages were farmed out to the highest bidder; the cultivator held no security; no rights of occupancy were recognised, and hereditary rights were not admitted, although, in practice, land often passed from father to son so long as the rent was paid. But fresh engagements were made from year to year and the previous tenant was ousted if he were outbid. In the Nagpur country, engagements for the government demand were taken from the village *patels* at the beginning of the agricultural year, but the amount for which they were to be responsible was not fixed or announced to them until sufficient time had elapsed for the character of the season to become apparent. No trace of fixed assessment or even assessment rates existed, and the demand from the village constantly fluctuated. As the *patel* did not know what sum he had to collect, each field was given a rent-paying value, or *ain*, and the demand, when known, was distributed over fields according to their *ain* value. In Chhattisgarh, the revenue-paying capacity was measured not by the field but by the

plough, and any inequality of assessment was corrected by increasing or diminishing the area of holdings. A first instalment of revenue was collected based upon the demand of the previous year; then, later, when the character of the crop was determined, a second demand was made. As most villages had four kinds of soil, and these kinds were scattered, it was considered necessary for each "plough" unit, to have samples of each soil in proper proportion. Thus a "plough" consisted of a *great* number of small, often tiny, plots scattered all over the village. Where the distribution of the land amongst "ploughs" was found to have become uneven, owing either to increase of cultivation or increase of cultivators, there was a system of *lakhabatta* whereby the inequalities were re-adjusted. The excessive fragmentation of holdings in Chhattisgarh is largely due to these causes.

The British found that the poverty of the people and the precarious condition of their agriculture precluded anything more permanent than yearly settlements until information was gathered on which longer contracts could be based. But as conditions became more determined, it became possible to extend the periods. The position of the *patel vis-à-vis* the cultivators or ryots was the subject of long consideration, and in 1868 the Government of India agreed to a proposal to accept the *patel* as *malguzar* with proprietary rights, subject to various restrictions on his right of transfer and also to the recording and maintaining of the rights of the cultivators or ryots. The latter thereby declined to the position of tenants of the *patel*, and subsequent legislation has been aimed at protecting their rights in the land. The result is a somewhat complicated series of tenures, with legal restrictions on ejectment, enhancement of rent, acquisition of new rights, and power of transfer. The major portion of the land is cultivated by tenants whose rent can only be enhanced at settlement and once, under certain conditions, during the currency of a settlement which is ordinarily in force for thirty years, and who are exempt from ejectment so long as they pay this rent.

In the cotton tract the average holding is about thirteen acres, in the rice tract it is seven acres and in the wheat tract nine. But this does not represent the actual area cultivated per cultivator, as brothers may share in one holding, and the same man may cultivate in more than one holding in his own and neighbouring villages.

In Berar, the system is different: eighty-eight per cent of the area is held directly from Government. The greater proportion of the ryots have full rights of occupancy, transfer and alienation, subject to payment of the revenue. The land revenue system of Berar is founded on that of Bombay.

4. THE CULTIVATOR.

The Central Provinces and Berar, while in area the sixth, is in population the seventh in order among the provinces of India. The total is nearly fourteen millions, and the density, while considerably greater than that of Australia or America, is much less than in the more populous parts of India, Egypt or Japan. The mean density, 122 persons per square mile, is the lowest in British India, except Burma. The cotton

tract is the heaviest, and the plateau division, the lightest in density. The density of population approximates to that of the less developed parts of southern Europe. Generally, there is every variety of caste and tribe mixed up together. Repeated incidence of widespread scarcity, following upon failure of the rains and the influenza epidemic in 1918, have retarded the increases of population which were recorded last century, and the effect has been enhanced by emigration due to the attraction of labour to the coal mines, the Tata works at Jamshedpur, the Assam tea gardens, etc.

No less than ninety-one per cent of the population live in villages, of which there are 47,576, the average distance between each being less than two miles. The cultivator very rarely lives on his fields or outside the *abadi* or site for dwelling places; but sometimes, as a result of the caste system or of congestion, small hamlets are formed which may be some distance away from the main village. Every cultivator has a right to receive house space free of charge from the head of the village. and it is only where non-agriculturists and traders are found that house sites attain any value. Most villages are small, their average population varying from 227 in the plateau to 399 in the Maratha plain.

Nearly five-sixths of the population are Hindus. There is a large number of Animists, the line between whom and the Hindus is not well defined. The two million members of the Animist community are almost confined to jungle tribes who venerate different deities at different times. They form one of the more serious problems before the administration.

Of the total population, over three million are forest or hill tribes, of which the most important are the Ghonds who now are mostly engaged in cultivation; the next largest group is one of hereditary cultivators, numbering less than three millions. The chief caste is the Kunbi, who with the Kurmi and the Kolta are the traditional tillers of the soil. Nearly a million persons are recorded as graziers and dairymen, amongst whom the Ahirs are the most numerous. The care of cattle and the sale of milk is their chief occupation. Other large sections are the weavers and leather workers. The principal landholding caste in the Central Provinces is that of the Rajputs.

Over 74 per cent of the whole population are occupied in agriculture, the next in order being industries (9 per cent) and commerce (5·6 per cent). Women work freely, there being 812 females for every 1,000 males amongst workers; they are employed in almost every occupation. In agriculture, they are employed as field labourers, cultivators and farm servants; there are actually more women workers than men in all mines except coal, in cotton spinning, in the small rope and wool industries, food industries, grain grinding, lime burning, stone cutting and dressing, and in labour on roads and bridges. In all occupations, the proportion of dependents to workers is 42 to 58. Of the total population, the proportions of males and females under fifteen years is 42·6 and 40·6 respectively, so that practically every person over fifteen is recorded as a worker.

The province possesses three sharply divided classes of rent receivers, rent payers and labourers, very few in any one of these classes appearing amongst the others. Similarly, very few of the rent receivers have any other source of income; very few engaged in other labour follow agriculture as a secondary occupation, and even the graziers do not practise agriculture; generally, the hereditary occupations keep distinct even from others closely akin to them.

There does not appear to be any shortage of labour for the type of agriculture in vogue, but, on the other hand, there are large portions of the province in which the *kharif* crop, which is reaped at the end of the rains, is the only crop of importance that is grown, and, when this crop is harvested, there is a scarcity of employment until shortly before the break of the next monsoon. The heavy seasonal demand, such as occurs at the time of cotton picking in Berar or in the north by the wheat harvest, is met by a corresponding movement of labour.

The simple needs of the ordinary villager require a blacksmith and a carpenter, who may sometimes be combined in one person, for their agricultural implements, a potter to supply them with inexpensive earthenware, and a shoemaker. In many parts, the blacksmith and carpenter are still village servants paid by a grain cess at the time of harvest, and there is always a supply of shoes and pots to be obtained within a few miles of the village at the weekly bazaars. Cottage industries are not important and have great difficulty in competing with the machine-made products. Weaving is universal and has recently received a temporary impetus from the movement in favour of country cloth or *khadi*. Silk-bordered weaving attains a high standard of efficiency.

One of the most striking things about the ordinary village is the scarcity of shops of any kind. The vast majority of the inhabitants depend upon the weekly bazaar for the supply of any commodity which they do not grow or make themselves. Few villages are situated more than eight miles from a bazaar village, and as each bazaar supplies the petty needs of all the villages for which it caters, it is self-contained and does not compete with neighbouring bazaars, but one dealer has a circuit and travels round from bazaar to bazaar, the days for which permit of arrangement of a tour. As a rule, transactions are in cash, but, where, as in the case of cloth, credit is sometimes allowed, payments may be made in grain. The village bazaars do not act as collecting centres for produce except in so far as payment is made in grain. There are more important centres where the cultivator may purchase cattle, sell grain, cotton or timber, or make his larger purchases of cloth. There are usually several cattle markets in each district which are held weekly, and during the more important religious festivals.

Although 74 per cent of the population are shown as dependent on agriculture, only 47 per cent are cultivators, the remaining 27 per cent being farm servants or labourers. Of the 6,600,000 cultivators, only 2,850,000 are usually regarded as cultivators by caste, the rest being jungle and hill tribes, etc. It is dangerous to attempt a picture of the "average" cultivator, but it may be said that he lives in a village with about 300

other people in sixty houses. Half of these houses will be found inhabited by cultivators. The net cultivated area will be round about 500 acres, or about ten to thirteen acres for each male cultivator over twenty years of age. For the work of tillage he will have a pair of oxen. He is surrounded by other villages, there being nearly 400 of these to every town. He is far from a metalled road, and usually several miles from the nearest bazaar. Thus, except in the cotton tract, he tends to produce for his own consumption and sells enough to pay his land revenue, which is about fourteen annas per cultivated acre per annum.

He lives free from the strain of congested districts. He could, if pressed, cultivate 56 per cent of the province, but finds 34 per cent ample for his needs. There are large tracts which could be cultivated with profit if there were any pressure on the food supply; he is not yet faced with the law of diminishing returns. He does little double cropping and avoids intensive cultivation. His methods are primitive; he employs little capital; in many villages he has no field work to do between the end of the *kharif* harvest in one year and the beginning of the monsoon in the next. He is illiterate, and prefers his boy's labour to his education; in his defence, he can plead that there is only one primary school for eleven villages, and distances are apt to be too far to send a boy every day. He is almost entirely dependent upon the monsoon, and has bitter experience of the cruel scarcity that befalls when the rains fail.

5. THE AGRICULTURAL DEPARTMENT.

The first movement towards improving the agriculture of the province began with the attempt to introduce exotic cottons in the years following the American Civil War. The effort ended in failure, although traces of the work are still in evidence in the distinct percentage of Upland Georgian cotton which persists in the cotton mixtures of the Wardha district. The farm which had been opened at Wardha was closed down in 1872 and a "model farm" was established at Nagpur. In 1882, this farm gave place to the Nagpur "experimental farm" under the control of the Land Records and Settlement Department. The activities of the farm, however, aroused no general interest, and, during the next twenty years or more, attempts at development were confined mainly to the setting up of various classes of instruction in agriculture at the farm school. It may seem strange, in the light of subsequent experience, that any attempt should have been made to initiate classes of instruction in the total absence of expert teachers and before all but the veriest beginning had been made in the application of modern scientific methods to Indian agriculture; yet the school was not without effect in that it turned out men with a smattering of agricultural knowledge, however inaccurate, who became the assistants of the subsequently recruited technical officers.

The construction of the department, as it exists today, began in 1905 with the recruitment of a technical deputy director. The old farm class gave way to the Agricultural College in 1906, and by 1907 the expert

staff had been strengthened by the addition of a second deputy director, a principal of the college, a chemist and a botanist; and five experimental farms had been opened. A review of the whole organisation in 1910 led to the creation of a Provincial Agricultural Service and to the division of the Subordinate Service into two cadres, an upper and a lower. A third deputy director was recruited in 1913 and a new and well equipped research institute was opened in 1915.

Unfortunately, just at the stage when a rapid advance might confidently have been expected, the war broke out and progress, if it did not stand still, at any rate received a very marked check. Four officers were released for military duty and the general control of the recently created Provincial Service devolved for some time on one officer only for the whole province. Not only so, but two of the officers took up appointments in other countries after demobilisation. Both were men who could ill be spared, but the loss of one, in particular, was the more unfortunate in that it left the province for a number of critical years without the services of a fully qualified economic botanist.

With the close of the war came rapid expansion both of the personnel and of the activities of the department. The expert staff at the beginning of 1928 consisted of eleven officers.

The province is divided for administrative purposes into four circles, each in charge of a deputy director, while one circle has a sub-division under an assistant director, thus making practically five circles. The headquarters staff consists of the principal of the college, the agricultural chemist, two economic botanists, a mycologist and a deputy director in charge of animal husbandry. The post of agricultural engineer is at present vacant, the former incumbent having resigned. The Provincial Service cadre has sixteen posts, nine of which are connected with district work under the deputy directors and seven are in connection with research and teaching under the specialist officers. The Subordinate Service has seventy-one posts in the Upper Division cadre and sixty-four in the Lower Division. These men are employed as farm and assistant farm managers, in district work, and as assistants in the teaching and research sections. Below the Subordinate Service is a grade of vernacular speaking men of the status of superior ploughmen called *jamadars* and *kamdars*, who number in all 148. The strength considered necessary in the Provincial Service and in the grades subordinate to it has not yet been attained and expansion will doubtless take place as funds permit.

The activities of the department may be dealt with under the following heads:—

(*a*) Research and investigation.
(*b*) Demonstration and propaganda.
(*c*) Livestock improvement.
(*d*) Agricultural education.

(*a*) *Research and Investigation.*—Research is carried out at the Research Institute and the experimental farms connected with it—the College farm

and the Akola farm under the principal of the college and the economic botanist respectively; at the five experimental farms under the deputy directors of agriculture; and, to a limited extent also, at most of the thirteen so-called seed and demonstration farms in the charge of deputy directors. For a long period in its history, central research was handicapped by the lack of suitable laboratory accommodation and of staff. The necessary buildings and equipment were provided only in 1915, and shortly afterwards the only two specialist officers then on the cadre went on war service. The other specialists, the deputy director in charge of animal husbandry, the mycologist, the second botanist and the engineer were not recruited till after the war and their work is only now beginning to bear fruit, while the entomological section is a minor one in the charge of a single assistant of the Provincial Service grade, much of whose time is taken up with teaching duties in the college.

The investigation of cotton was taken up by Dr. Clouston more than twenty years ago and the common mixture of cottons known as *jari* was isolated into the six common types of cotton prevalent. The testing of these resulted in the separation of *roseum*, the characteristics of which are a short coarse staple, a high ginning percentage and a high yield. The distribution of this variety on a large scale has been a subject for criticism but the fact remains that it is still the most paying cotton which the cultivator, whose land is free of wilt, can grow.

Another of the earlier examples of selections is found in the *juars*, two varieties of which, selected very early in the history of the department, still stand out as the best in common use. Similar work on rice in the north and east of the province has produced several varieties of paddy which are now generally grown in these areas; and the work on wheat has left a distinct mark on the character of the crop grown in the north of the province. Early work on sugarcane led to the isolation of the hardy *khan* variety which has practically entirely replaced all the other local varieties. Of late years, the products of the Coimbatore cane-breeding station have also been under comparative tests on different farms of the province and there is little doubt but that *khan* will shortly give way to some of the new varieties.

The field work connected with the research of the specialist officers is done on portions of the college farm set apart for the purpose, and besides this the first botanist now has the Akola experimental farm under his direct control. Plant breeding by the botanical section was taken in hand seriously in 1921, chief attention being paid to cotton, groundnut and *juar*. The earlier attempts to improve cotton were, as we have seen, successful in the direction of selection for high yield rather than in improving the staple. The Indian Cotton Committee's Report, however, had pointed to the advisability of devoting more attention to the problem of finding a variety with a better staple and it is to the solving of this problem that the main efforts of the first botanist have been directed since 1923. The work is being assisted by the funds of the Indian Central Cotton Committee. The aim is to find a cotton which will give an

improved staple without at the same time losing its economic advantage by reason of low ginning percentage and low or uncertain yield. The problem is by no means an easy one, complicated as it is by the conditions under which cotton is grown—the short growing season and the general absence of irrigation facilities. The improved cotton, when it comes to be given out, will find a strong competitor in the short staple, hardy, high yielding *roseum* which at present holds the field. Nevertheless, it is understood that promising strains have been isolated and are now being grown on a field scale. The rest of the activities of the first botanist and his staff are concerned with crops which form a suitable rotation in the cotton tract.

A second botanist was appointed in 1925. His research operations deal mainly with the breeding of local wheats and pulses, and he has begun an investigation into the fodder and grass problems of the province.

The mycological section came into existence at the end of 1920. Active work began with the appointment of the present officer in charge in 1922. The principal research work in hand is a study of cotton wilt financed by the Indian Central Cotton Committee and investigation has been made into *juar* smut. The causes leading up to loss by foot-rot in wheat have been examined, and various other crop diseases are under investigation.

A great deal of the work of the chemical section is in the nature of team work with other branches of the department. The section is steadily carrying out a full analysis of the soils typical of different parts of the province and different crops. Recently an investigation has been made into the formation and loss of nitrates in the soil and this work will form an interesting complement to similar work in process in other provinces.

Such time as the entomological assistant has at his disposal for research work has been devoted to the problems of the sugarcane-borer, the cotton boll-worm, cotton leaf caterpillar, pests affecting rice, *juar*, and various fruit trees.

The engineering section was started in 1920. Much work in connection with implements had previously been done by the deputy directors and the principal of the college, the most outstanding result from which is to be seen in the large numbers of improved ploughs, manufactured by British and Indian firms, which have come into use in the province, especially during the past half dozen years. Types suitable to each tract now find a ready demand. Among machines, the most successful introduction has been the three-roller cane-crushing mill manufactured in the Punjab, and water-lifts from the same province are beginning to make their appearance. Since the engineering section was formed, the design of simple implements capable of being manufactured locally has received attention, and the engineer, in collaboration with the principal of the college, has carried out detailed trials of tractors and small power plant suitable for use on the larger holdings. An important function in the engineer's section is the class of instruction in tractors

and oil engines held every year, for the benefit of the sons or servants of such agriculturists as own these plants.

It is unnecessary to go into details of the investigations which have led to improvements in the methods of growing the staple crops. Such problems as seed rates, spacing, sowing methods, the character of cultivation best suited to different crops under different conditions, the limitations within which deep ploughing is advisable, water requirements, etc., have all received attention on the experimental farms. One of the most difficult problems to solve is the question of manure. It has been satisfactorily met as regards sugarcane and the more valuable garden crops, but the manuring of dry wheat has been found to be impracticable except through another crop or by means of leguminous rotations. The benefits of green-manuring on paddy land have been proved, but the difficulty remains of applying the system in the peculiar conditions of the paddy tract. Top dressing of cotton with artificials has given good results with the superior cultivation practised on government farms, but whether it will pay under the cultivator's field conditions and under the downward tendency of cotton prices remains to be proved. Steps have been taken for the better conservation of such farmyard manure as remains for agriculture after the requirements for fuel have been met.

(*b*) *Demonstration and Propaganda.*—The organisation by which the results of research are brought to the notice of the cultivator is under the control of the deputy directors. At present, each circle is divided into two sub-circles each under the charge of a Provincial Service officer, and consisting generally of two or more revenue districts. Under the Provincial Service officer, are a number of agricultural assistants belonging to the Subordinate Service; when numbers permit, the aim is to have one such assistant for each tahsil. In general, each assistant is given one year's training or more on a farm, after completing his college course, before he is entrusted with district work.

The main centre of interest in the circle is the experimental farm which is under the direct control of the deputy director. The staff generally consists of a superintendent, a couple or more of trained assistants and one or more assistants under training (all members of the Subordinate Service). In addition, there is the farm clerk and the menial staff. Part of the farm is devoted to detailed experimental work which consists of the investigation of local cultivating problems, the testing of varieties selected or bred on the farm or imported from outside the circle or province, the trial of new varieties from the botanical section or of a particular variety which the mycologist or entomologist wishes to try out with reference to immunity to disease; or it may be that a manurial problem is being worked out in collaboration with the chemist. The rest of the farm is taken up with trials, on a field scale, of the results emerging from the detailed experimental work. These trials determine the suitability of a particular variety or a particular method of cultivation for inclusion in the general agricultural practice of areas which are similar in conditions of soil, rainfall and temperature to the conditions existing on the farm.

A circle is a big area, however, and it does not follow that a variety or method which has proved suitable on the experimental farm will prove of equal merit elsewhere. To provide for this, seed and demonstration farms have been established, at least one of which is located in each sub-circle under the general supervision of the Provincial Service officer in charge of the sub-circle, and in the immediate charge of an experienced agricultural assistant. The object of these farms is to test the experimental farm varieties as regards their suitability to local conditions and, when that has been established, to produce seed for distribution. Another important function they discharge is the stocking of implements, machines and manures suitable for the tract, financed by a permanent advance from Government for the purpose. They are supposed to be purely commercial in character but they do not differ in any marked respect from the less intensive experimental portion of the headquarters farm. For this and other reasons it is not always possible to run them on a paying basis.

All the seed grown on the experimental or seed farms, except that of discarded varieties, is handed over to the agricultural assistants engaged in district work for distribution for sowing. Their business it is to bring it to the notice of the cultivator and to persuade him to adopt it. Comparatively few cultivators except those within a narrow radius of the experimental and seed farms ever take the trouble to come and see for themselves and so improvements have to be demonstrated at their doors and at fairs and festivals where they congregate. The demonstrator assistant's life is a strenuous one ; he tours from twenty to twenty-five days in the month the whole year round, according to a programme laid down by his superior officer. His activities vary according to the season. When he is concerned mainly with implements he organises ploughing matches, he carries a plough about with him, works it for a day or two in a village, collects orders and passes on to another village. For seed distribution he depends largely on the private grower to whom he supplies fresh seed from the government farm on condition that the grower will do his best to keep it pure and will sell as much of it as he can to his neighbours for sowing. When he is concerned with a complicated demonstration of a new crop or a new method, a plot is leased for him for a period of five years or less and put in charge of a resident *jamadar* ; if the demonstration is a simple one he carries it out on the cultivator's own fields.

The purely departmental propaganda agency is supplemented by various non-official agencies. Chief among those, leaving aside the individual seed growers already mentioned, are the district and tahsil or taluk agricultural associations. Under a scheme recently put into operation in the north of the province, these associations are financed by Government to enable them to purchase a stock of seed from approved seed farmers. This they lend out to the members of the association on twenty per cent interest, *i.e.*, on the return of the lent seed stock and twenty per cent added at harvest. From the new stock the association repays, each year, ten per cent of the original capital advanced by Government

and ten per cent interest on the balance of capital still outstanding. The rest of the seed is lent out to members on the same terms the following year. After the scheme has been in operation fo ten years, the association will thus have repaid the government advances in full and will have in its possession seed stock equal to the value of the original loan, plus an additional reserve, on account of the diminishing interest charges, which it will be able to cash and utilize for other forms of agricultural improvement. In Berar, several taluk associations have taken up implement as well as seed distribution, maintaining their own implement stores from which ploughs and machines are sold or given out on hire. Smaller organisations than those of the tahsil or taluk are the unions of seed growers who supply improved seed to the public, and the circle and village associations, all concerned mainly with seed distribution.

Although several successful associations are in existence there are many others which have failed to be of any great practical utility, and even the best of them are indebted for their success more to the efforts of a few individuals rather than to the joint efforts of the members. Perhaps the reason for this may lie in the method of their development. *The district associations were the first to be formed, then the tahsil.* Originally, membership was built up by the haphazard selection of the bigger men without very close regard to their interest in agriculture; of late the tendency has been to develop the smaller unit, the revenue inspector's circle association, with the intention of building up the tahsil association by election of representatives from the lower unit, and the district associations in like manner from the tahsil associations.

It remains now to consider to what extent the activities of the department are reflected in the agricultural practice of the province. There is no detailed information as to the total areas on which seed originating from government sources is sown, but the published figures show that in 1926-27 private seed farms, of which there were 8,770, supplied over eight thousand five hundred tons of improved seed of the ordinary staple crops. It was estimated that half a million acres were under improved cotton, 135,000 under wheat and 104,000 under paddy. These figures must be regarded as approximations only, for the department has no means of ascertaining accurately the areas sown from the natural spread of seed issued in previous years. As an indication of the probable accuracy of the estimates, it may be noted that, in the wheat tract, the sample now being offered in the principal markets is about ninety per cent pure compared with sixty to sixty-five per cent pure ten years ago, and a hybrid wheat issued to the public in 1923 is coming into the market in sufficient quantities for commercial purposes and separate shipment, and has already acquired a trade name. Other examples of definite progress are the introduction of groundnut which was practically unknown in the province fifteen years ago and which extended to over 44,000 acres in 1926; the almost complete replacement of the old varieties of sugarcane by an improved indigenous variety, and the introduction from Nagpur into the north of the province of a variety of sesamum which is now in general cultivation there

Better cultivation in all tracts has followed on the extension of the use of the inversion plough. In the cotton and wheat tracts its value in cleaning the land is widely recognised and even small cultivators come forward to hire the use of a tractor when unable to do the work with their own bullocks. Ploughing in Berar a dozen years ago was a matter of rare occurrence; now it is coming into general practice. In 1925-26, when the cotton crop was poor and the prices low, between four and five thousand ploughs were sold and in each of the two previous years, when better economic conditions prevailed, the sales approximated 8,000. A three-roller iron cane-crushing mill has replaced the old inefficient wooden mill and an improved type of *gur*-boiling furnace has been adopted which requires no fuel except that which the crop itself provides.

Examples of better methods of technique are to be found in the adoption of line-sowing in the north of the province in place of the former universal system of broadcasting all *kharif* crops, the substitution of the single or double seedling practice in the transplanted rice areas in place of bunches of eight or ten, and the prevention of smut in *juar* by treating the seed with copper salts.

Estimates of the financial advantages which have attended the efforts of the department must be largely speculative for, though it is possible to gauge them with tolerable accuracy on a carefully managed government farm, it does not follow that the same results are obtained on an indifferently cultivated private holding. The departmental estimate puts the extra value of improved wheat and paddy seed at five rupees an acre, *roseum* cotton at seven to ten rupees, sugarcane at thirty to fifty rupees. To the profit resulting from planting the improved cane has to be added the economy effected by the substitution of the new type of *gur* furnace as well as the higher yield from better cultivation and manuring. Improved methods must have had their effect in raising the profits from other crops as well but these are more difficult to compute.

(c) *Livestock Improvement.*—The province carries a population of approximately twelve million head of cattle and buffaloes, chiefly the former. Other kinds of livestock are relatively unimportant; the indigenous pony is comparatively worthless, so worthless that attempts to improve it have been abandoned; goats and sheep are bred in fair numbers by the professional shepherd castes, the former for food, for milk, which Muhammadans and low-caste Hindus drink, and for offerings to the deities, and the latter principally for their wool. Buffaloes are kept mainly for dairy purposes; male buffaloes are not used for draught except in the rice tracts, which absorb the young male stock bred in other parts of the province.

Except in one or two localities, for example the home of the Gaolao breed in Chhindwara district and part of Wardha district, the indigenous breeds are of very poor quality. The popular belief is that the quality is steadily deteriorating and that the deterioration is due to the expansion of cultivation and the consequent contraction of the areas available for grazing. If this is true, it is true only in a small degree for the cattle are at their best in the cotton tract where grazing is scarcest. The real reason appears

to be that economic considerations affect the cattle policy of the ordinary cultivator only to a very small extent, if at all. He does not, as does the farmer in western countries, take stock of the food resources of his holding and limit the number of his herd accordingly. Every animal that is born into his herd is allowed to live on, irrespective of whether it is likely to be of any economic value or not; similarly, when a cow ceases to produce calves or milk or when a bullock is past work, it is allowed to linger on in the herd, eating up the food which is all too scanty for the proper maintenance of the more useful animals. The cultivator's main argument for maintaining large numbers is that they provide him with manure, but he forgets that the total amount of manure produced is governed entirely by the amount of food available, and that a given amount of food will produce as much manure when eaten by a smaller number of well-nourished animals as it will when divided among a larger number of under-nourished ones. The results are seen at their very worst in the Chhattisgarh division where every village owns a large herd of miserable looking, undersized animals which produces only a fraction of the number of bullocks required for cultivation, and whose only other main economic use is the production of fuel and of the small proportion of the dung reserved for manure. Apart from rice straw and perhaps a little grain for the bullocks at busy working seasons, the cattle depend for their livelihood upon what they pick up on the common grazing grounds and rice *bunds*. From August till January they fare well enough, but they are in a state of semi-starvation right through the hot weather and large numbers fall a prey to disease. Conditions are somewhat better in the wheat country, and very much better in the cotton-*juar* tract where the limited grazing necessitates stall feeding with *juar* and cotton-seed.

Cattle improvement has not kept pace with the other activities of the department although breeding herds began to be established as long ago as 1901. The slow progress has been ascribed, in part, to the fact that these herds were in the charge of deputy directors already overburdened with other work and unable to give that close attention which breeding work demands Other factors which retarded progress were the difficulty experienced in settling down to a definite comprehensive policy, and the very restricted scale on which operations have been, and even now are being, carried out. The general problem before the department was, firstly, to improve such pure or approximately pure breeds as existed; secondly, to improve the nondescript stock of such areas as possessed no particular breed; and, thirdly, to introduce better milking qualities into the pure and mixed breeds alike. Where work has proceeded with a single definite aim in view, a measure of success has been attained. One example is the pure bred Gaolao herd at Garhi which is being improved in the direction of draught qualities alone, another the Malvi herd at Powarkheia with the same objective, and a third the Montgomery herd at Telinkheri, the object of which is to provide a breed which will increase the milk supply in urban areas. This success has apparently attended efforts in the direction of evolving a dual purpose animal. On several farms, an attempt has been made to achieve it by breeding pure Montgomery bulls

on to the local stock, a policy which, while it certainly improves the milking capacity of the female does not so certainly improve the draught qualities of the male. Two more attempts at arriving at the dual purpose animal are represented by the Malvi-Montgomery herd at Adhartal where cross-breds will be mated with cross-breds and the college dairy herd where a more intricate hybrid is being evolved, namely a cross which is to be half Montgomery, quarter Ayrshire and quarter Hansi. Here again cross-breds will be mated to cross-breds. Both of the last named herds are purely experimental and the work has not yet reached a stage at which its ultimate value can be estimated. No attempt has yet been made to improve the milking capacity of the cattle of the Chhattisgarh division. The local cows have been crossed with pure Malvi bulls with the object of producing a better draught animal. The resulting first cross was an improvement on the local cattle as regards size and bone but the country is too poor to maintain a big animal such as would result from further use of pure Malvi blood, and the second generation of crosses bred to crosses are no bigger than the original Chhattisgarhi animal.

The scale on which operations are being conducted is sufficiently indicated by the fact that the most important cattle farm in the province carries a stock of only sixty cows of breeding age, and that none of the remaining ten farms are capable of carrying more than thirty cows. The total number of breeding bulls of all kinds which the department issued from all its farms in 1926-27 was sixty-three, a number of these being cross-breds of doubtful ultimate value. The merits of the bulls apart, however, it is obvious that at this rate of progress many years must elapse before any general improvement can be effected. That the local Government is alive to the needs of the situation is shown by the appointment, in 1923, of a whole-time officer for cattle breeding and by the schemes for rapid extension which are now maturing. Proposals are under consideration for the transference or extension of some of the present breeding farms to larger areas, for the provision of two forest areas each of which will support a large herd of selected local cows to be graded up by the use of pure-bred bulls, and for the conversion of certain of the existing small breeding farms into sale depôts. Till the stock on the proposed large breeding areas reaches the requisite standard of purity, the males will go on to the market as bullocks, while the bulls from the already established pure-bred herds will continue to be utilized for meeting the demands of the existing "premium bull" scheme. When a condition of sufficient purity is reached in the grade herds, it is hoped that it will be possible to put out three hundred bulls per year and that number will make it possible to concentrate on the improvement of the cattle population, area by area, as is now done in the Punjab.

The fodder problem is almost more difficult than the breeding one. A number of new fodders have been tried, of which the best is *berseem*, but it can be grown only under irrigation and seed is both expensive and difficult to provide for large areas. Heavy yielding fodder sorghums have been isolated and their cultivation extended and efforts have been made,

by the introduction of fodder-cutters, to make the existing supplies go further. Attempts are being made to encourage the preservation of monsoon fodders and grasses in the form of ensilage, and experimental work in connection with the improving of grass lands has recently been started.

(*d*) *Agricultural Education.*—The first attempt at imparting instruction in agriculture began in 1886 with the establishing of a two-year course of study at the Nagpur farm, its main object being the training of subordinate revenue officials. A normal class for village schoolmasters was undertaken in 1899 and was subsequently abandoned, and a like fate overtook a vernacular one-year course intended for the sons of influential landholders which was in existence between 1901 and 1910.

With the general movement on the part of the Government of India in 1904 towards the improvement of agriculture, the need for a higher and more scientific course than that given in the original farm class became apparent, and the old class was replaced by the college in 1906. The original college course was one of three years, the entrance standard being the university matriculation. After sundry changes the college settled down in 1921 to two courses, one of four years' duration leading to the college diploma and the other of two years leading to the college certificate. The former was steadily developed so that, in 1925, it was able to be affiliated, with but a few minor changes, to the Nagpur University as a B.Sc. degree course. The two-year course still continues.

In the degree course, instruction is given in agriculture, surveying, mathematics and English. The first elements of the sciences bearing on agriculture are introduced towards the end of the first year and increasing attention is devoted to those in subsequent years. A feature of the second year is the amount of attention given to practical agriculture. A block of ten to twelve acres of the college farm is worked co-operatively by the students under the supervision of an assistant, and the profits of cultivation go into their own pockets. In the third and fourth years, mathematics and English are discontinued. Training in field experiment work is given to the third year class, and the fourth year students are each allotted a simple subject for investigation on which they are required to produce a thesis.

The two years' course concerns itself mainly with practical agriculture. Except that direct science is almost entirely omitted, it follows, on the whole, the lines of the first two years of the degree course and includes, in addition, first aid, carpentry and blacksmithy.

The college also gives short courses in animal husbandry and dairying.

Since 1916, the certificate has been awarded alike to men taking the two years' and the four years' course on the results of the intermediate examination at the end of the second year, and only those who have attained a first class certificate have been allowed to proceed further.

The college is strictly residential; the hostel provides accommodation for 115 students and is fully occupied. Candidates for admission

require to be of good physique, they must belong to families directly connected with agriculture, and they must be reasonably well educated. In the past, the better educated students have been attracted more to professions like law and medicine than to agriculture, and even a degree in arts is held to confer a social status superior to that of the licentiate of an unattached college. Now that a degree course has been established, a higher standard among the candidates for admission may be hoped for.

Service in the Agricultural Department is still the goal most desired. A few of the four-year men are recruited annually to the Upper Subordinate Service, and some of the two-year men find posts in the lower cadre. A few are given appointments in the agricultural departments of other provinces, some are managing private estates and some have gone back to manage their own land. It is unlikely, however, that the expansion of the provincial departments will keep pace with the output of qualified men, and more and more of them will be forced to adopt agriculture as a profession.

Certain attempts have been made to meet the demand that definite agricultural instruction should be imparted in rural schools. The most important of these was the opening of two schools in the year 1918-19, one in the wheat tract and the other in the rice tract. These schools were originally designed with the idea of taking, from the upper standards of the middle school, sons of cultivators who in normal conditions would, on leaving the middle school, return to their land and of giving them a finishing education largely agricultural but including some general education on lines applicable to their profession. At first, there seemed to be a future for these schools and with the aid of a vast amount of propaganda a certain number of boys came forward, but attendance soon fell away and interest declined. The school in the rice tract is now closed. The one in the wheat tract has been gradually changed from a vocational to a pre-vocational school and is now, to all intents, a vernacular middle school, taking boys from the fifth to the eighth standard, and providing a course which replaces elementary science, drawing and history by agriculture and surveying and gives the boys two hours' practical work per day on the farm. In this form, it shows signs of proving popular among the better class cultivators and landowners in its locality.

Finally, an attempt has been made to give the pupils of an ordinary rural vernacular middle school three or four hours a week in practical agriculture on a departmental demonstration plot near the school. This simple form is about to be extended, where possible, in co-operation with the Education Department.

6. THE VETERINARY DEPARTMENT.

The Veterinary Department was founded in 1901 when a Superintendent was appointed to work under the Director of Agriculture. The two departments have since been separated, and veterinary work is now under its own technical head. There is no college; students from the veterinary colleges at Madras, Bombay and Lahore are recruited, and students from the provinces are given stipends from Government for training at the

Bombay college. The personnel of the department, in 1926-27, consisted of 2 superintendents, 6 deputy superintendents, 16 inspectors, and 131 veterinary assistant surgeons. The cadre is not full. There are dispensaries at all headquarters of districts and in most tahsils, making a total of 94, and 33 of the veterinary assistants are in charge of travelling dispensaries, visiting villages and rendering such aid as they can to the cattle there. The staff, although on the increase, is still insufficient for the work to be done, but the people are displaying more and more appreciation of the advice, and help available and the number of cases treated has increased eightfold in the last twenty years.

The incidence of contagious diseases is high, and the province suffers from the import of infected cattle from surrounding Indian States for sale at the various fairs; the local Government have power to exclude, from fairs, animals suffering from contagious diseases, but this hardly touches the main problem. There is not the staff required to detect and control disease-bearing herds, and little can be achieved without the co-operation of neighbouring States and provinces.

Castration work with the Burdizzo instrument is rapidly expanding, and should lead to considerable improvement in quality and a lower incidence of pasturing on overstocked forest and village lands. Cattle breeding is not undertaken by this department.

A central veterinary laboratory at Nagpur, which the department shares with the agricultural staff, performs useful functions in the correct diagnosis of disease from smears sent in by district officers. Nearly 20,000 cases were received in the last year reported on, and preventive measures are thereby facilitated. The staff have little time for research; a scheme for a properly equipped laboratory for research in local problems is under consideration.

7. IRRIGATION.

In the Report on the Administration of the Central Provinces for the year 1881-82, there appears the following item:—

"2. Canal Revenue.
7. There are no canals in the province."

Since that date, considerable development has taken place. The chief irrigation systems at the present time are: the Mahanadi Canal which draws its supplies from the Mahanadi river and the Maramsilli reservoir; the Tandula Canal which is fed by the reservoir at Adamabad; and the Wainganga Canal which takes off from the river of that name. These three systems, between them, supply water to about two-thirds of the area irrigated from government sources. In 1926-27, there was assessed a gross area of 423,040 acres, and realisations of revenue amounted to Rs. 12·91 lakhs. The change was forced on the administration by a succession of disastrous famines due either to a deficiency in rainfall or to the early cessation of the monsoon. Early schemes were rejected on the ground that they would prove financial failures; but the cost of famine relief in 1899-1900 amounted to nearly six crores of rupees altogether, and the need for irrigation works for

protection against the recurrence of similar disasters on a comparable scale was brought prominently to notice. Within the famine period, there was expended forty-five lakhs of rupees on the repair of private tanks and wells, and about five lakhs of rupees on the construction of eleven new government works; so that it may be said that the construction of State irrigation works began then. The Report of the Irrigation Commission of 1901-03 resulted in the adoption of a new policy.

Conditions for irrigation works in these provinces present greater difficulties than in some others. Although the rainfall is less subject to variation than in other parts of India, it is apt to be very unevenly distributed, especially during the latter months of the monsoon, when the time is critical for both *kharif* and *rabi* crops. The average annual rainfall over the provinces is about 41·5 inches; it varies from 30 inches in the Berar plains to 75 inches in the Pachmarhi hills.

A deficiency of twenty-five per cent is injurious to crops, while one of forty per cent leads to serious scarcity. In the critical month of September, a deficiency of twenty-five per cent occurred in 19 years out of the 33 preceding the sittings of the Irrigation Commission. The problem is to ensure a good crop by making up any deficiencies of rainfall in September and October. But when the rainfall is adequate, there is no demand for water; and even in bad seasons, the cultivators hope that rain may yet fall and spare them the expense of canal water. As hope fails, when already the crops have began to deteriorate, a sudden demand springs up; everyone wants water at the same time from channels designed to give it by rotation. The time involved in supplying the needs of the fields means delay for some and a consequent loss of revenue. Where a normal rainfall is sufficient to ripen a crop, a system of irrigation based upon a supply only where there is a demand is not suitable. To meet the difficulty, cultivators in each village are encouraged to enter into long-term agreements whereby payment is made whether water is actually taken or not, the rate being reduced for those who enter into the agreement. This system is proving successful and much facilitates the work of distribution. A further difficulty arising from the lack of water-courses from the government irrigation channels to each field can only be solved by the action of the cultivators themselves.

The scope for beneficial irrigation is less than might at first sight appear. Wheat is more likely to suffer from an excess of moisture than from drought; the black cotton soils have been regarded as unsuited for irrigation as they are apt to be too retentive of moisture, while large areas are on undulating ground. In other places, there is no source of supply even if the soil were suitable. The light upland soils do not require irrigation even if they could be commanded. The rice areas, however, offer prospects of success, and have, in consequence, received most attention. The Irrigation Commission recommended an expenditure of three crores of rupees in twenty years, which they estimated would suffice for the irrigation of 450,000 acres; actually, five-and-a-half crores have been expended and the average area irrigated in the last six years has been 423,330 acres. It

is expected that the schemes which have been completed or are at present under construction will eventually irrigate about 900,000 acres.

Rice is the main crop dealt with Irrigation for *rabi* crops is not popular, and a reasonable rate for water for wheat seems to be only obtainable in a tract in the Saugor district. The new canals are designed only for rice irrigation.

From the above, it will be seen that the problems facing the administration are peculiarly difficult. Famines have been too frequent and too severe to permit of any neglect of measures that promise a remedy, but in between these years of scanty rainfall, there is little need for canal irrigation. Thus it became necessary to decide whether to irrigate a small area thoroughly and make this safe from the vagaries of the monsoon or whether to spread the irrigation over a much larger area, thus affording promise of enhanced prosperity in the normal majority of years but involving the risk of bad years. It was eventually decided to adopt the latter course; it held out a prospect of greater benefit over a series of years and so seemed more likely to assist the people to resist a time of acute distress.

With a few minor exceptions, the works are not productive; the highest figure for revenue has reached only 2·02 per cent on cost, and it is not expected that a return of 2 per cent will be exceeded for some years to come. On the other hand, the value of the works as a protection against scarcity in areas which have suffered from frequent failure of crops in the past and as a means of increasing the produce in normal years should be very great. In the report of an economic survey in Chhattisgarh made by Mr. J. C. McDougall, Deputy Director of Agriculture, it is related that in two groups of ten and seventeen villages irrigated by the Pindraon tank in the Raipur and the Khapri tank in the Drug district, the population increased between 1911 and 1921 by twenty per cent and forty-five per cent respectively, against an increase of only six per cent in the Raipur district as a whole and a decrease of four per cent in the Drug district. Although much has been accomplished under great difficulties, a very great deal more remains to be done before the provinces can be regarded as adequately protected against scarcity.

In the three rice-growing divisions of Chhattisgarh, Nagpur and Jubbulpore, the area under rice is about five million acres; of this less than nine per cent is irrigated by private works, and about another nine per cent by government works. When those government works which are contemplated or under construction are completed, it is estimated that about eighteen per cent of this area will be irrigated from government works. The most precarious districts have little private irrigation, and therefore the more need for public canals. But in these districts, comprised in the Chhattisgarh division, the cultivators are said to be lazy and unenterprising; they do not transplant the rice, and excessive fragmentation of holdings restricts progress. The need for new canals is acknowledged, but it is difficult to justify their construction until further experience is obtained of results from the Mahanadi Canal and of the willingness of the people to renew their agreements when the first period

has expired. Elsewhere, the soil where rice is grown is light, and, without manure, becomes exhausted to a point which permits of little benefit from irrigation. Thus, irrigation is not likely to secure full appreciation until the manure question is solved.

In other districts, the expansion of irrigation must wait upon the willingness of the people to enter into the agreements. With a sequence of good years, progress in this direction is apt to lag, while one year of short rainfall would considerably influence the rate of acceptance.

The obstacles to extension of irrigation are many: cost is high where storage has to be provided; the difficult nature of the country to be traversed adds to this; when a fair crop is obtainable in good years without irrigation, the people are naturally unwilling to pay for water which they can do without, and this leads to great uncertainty as to the financial results; the fact that irrigation is not wanted for the spring crop and so is confined to the autumn one, makes the maintenance expensive. The poor standard of cultivation necessitates low rates for water, while the shortage of manure detracts from the full benefit of irrigation. Thus, it cannot be said that there is undue delay in constructing new works and much must be done before better financial results can be expected. It is also worthy of mention that the economic position of the people has much improved since the Irrigation Commission made their inquiry, and the need for further irrigation is not so acute as it was. It seems practically impossible to devise a scheme that would be productive, so that the case for further irrigation depends upon the need for protection against famine. At present, the works just about pay running expenses without counting interest charges.

8. FORESTRY IN RELATION TO AGRICULTURE.

Government forests cover 19,677 square miles, or about twenty-four per cent of the total area of the province; in addition there are large areas of privately owned forests. It is the policy of Government to assist the agricultural classes by providing grazing facilities at rates which are purely nominal for small holders and which only approach the commercial value of the produce removed in the case of large herds.

Every genuine cultivator is allowed to graze four cattle for each working plough, at rates varying with the locality from one to three annas; thus a man with four cattle pays not more than one day's wage per year for grazing. If he possesses more cattle than allowed by the scale, he pays ordinary rates up to the limit prescribed for commercial rates. The value of the concession due to privileged rates is estimated at ten lakhs of rupees a year.

Of the total area under Government, only 3,164 square miles, or about one-fifth, is closed to grazing and even this is open to cutting; 3,921 square miles is open to all animals, and the remaining 12,488 square miles is open to all except browsers. The closures are arranged so as to preserve to the local population adequate facilities in areas conveniently situated, and care is taken to secure a separate scrutiny by the Revenue Department which consults the people affected. That the facilities are freely enjoyed

is indicated by the fact that while the total number of cattle, sheep and goats is about thirteen million, over three-and-a-half million are grazed in the forests. The average revenue realised is about six annas per head. The number of cattle on privileged rates is just below 1,900,000, while 973,012 pay higher rates.

In addition to facilities for grazing, the department is also attempting to place at the disposal of cattle owners the grass in areas closed to grazing. Experiments in the supply of baled grass for stall feeding were not successful owing to the absence of any demand, although the bales were offered at cost price. Licenses to cut grass at low rates are available but, except for thatching, little is removed in this way. The system of permitting contractors to purchase in auction the right to cut grass for sale is somewhat more popular in some tracts, and is being continued where the people display no preference in favour of cutting for themselves under license.

Bona fide agriculturists are permitted to take dry firewood, timber, etc., at special low rates, and attempts are made to supply the local demand from areas of forest adjoining. A scheme to place at the disposal of the people cheap firewood from fuel depôts at convenient centres in order to remove the need for burning cowdung has not met with encouraging results. The continuance of this immemorial custom with firewood stacked almost at the door suggests that it is not lack of firewood which robs the soil of valuable manure.

In other ways, every effort is made to meet the legitimate demand for forest produce, such as leaves, fruits, etc., and it is claimed with reason that the forests in these provinces are being worked primarily for the benefit of the agricultural population. Where land is suitable for cultivation, it is given up to agriculture, and in this way nearly 2,500 square miles have been disafforested in the last twenty years. Few, if any, areas remain which could better be devoted to crops. If there were any room for complaint it would be that grazing has been permitted to an extent which endangers the continuance of the source of supply, and attempts are being made to limit the number of animals by negotiating grazing settlements. As has been already intimated, low rates for cutting grass or for grass cut by contractors do not relieve the pressure.

There does not appear to be any present danger from erosion as a result of disafforestation; there is an old rule forbidding the cutting of trees within twenty yards of either bank of a stream.

9. GENERAL EDUCATION.

The task of combating illiteracy in the provinces presents much the same difficulties as are found elsewhere. The poorer classes refrain from sending their boys to school; of those who attend the infant class, few survive through the whole course, and, of those who pass through, a considerable number lapse into illiteracy. Between the census period 1911-21, the number of persons returned as literate increased from 521,187 to 661,553, or about 14,000 per annum. In the same period, the number of pupils of all grades increased from 289,157 to 333,303 or 44,146

in ten years. The departmental report for 1926-27 shows a total of 399,289 pupils, of whom 341,614 are in the primary stages. Of these latter, however, forty-six per cent are in the first or elementary class, and only 50,851 in the fourth class. The last figure may be taken as representing the annual addition to the literates of the province; if 15,000 be assumed to be required to cover loss from deaths, then there should be an annual increase of literates of nearly 36,000. Anything less than this must be largely due to the lapsing into illiteracy and this wastage is clearly considerable. "It is a fact" says the Census Report for 1911, "that many who go through the primary schools in youth lapse into complete illiteracy at a later age, this being specially the case in the cultivating classes, who have little stimulus to keep up their education after leaving school." In the Census Report for 1921, it is suggested that "the tendency to relapse into illiteracy which is very prevalent among the cultivating classes is, if anything, on the increase." The management of primary schools is mainly in the hands of local bodies, and of these, while some evince active interest, others are apathetic. Many of their teachers are untrained; their prospects are poor, and they have little inducement to exert themselves. The only remedy for the disparity between the numbers in the first class and those in the fourth, and also for irregular attendance, is compulsion wisely applied; but compulsion without courage in its application is apt to give an attendance not much better than in voluntary schools. On the whole, present experience of the application of compulsion in the 66 villages in which it is tried is encouraging. Where this is applied, education in the primary course is entirely free; elsewhere a very small fee is levied, but there is some expenditure on books. Unfortunately, such progress as has been gained has been more marked amongst those classes who are not engaged in agriculture. Most rural schools have garden plots, but these are apt to be too small; and although efforts are being made to introduce nature study, it is found extremely difficult to get satisfactory teachers in this subject.

Agriculture was tried as a subject for the matriculation but it was purely a text-book study and was found to be of no value and therefore omitted. Adult education is not regarded as of major importance.

From the foregoing it will be realised that, while progress is steady, it is not rapid. The aboriginal section of the population is as yet scarcely affected; the higher castes amongst the Hindus and the urban Muslims show satisfactory figures, but the predominantly cultivating classes are not taking readily to the opportunities offered by the 4,523 primary schools in the provinces. One remedy suggested is concentration on the more flourishing institutions. "Some schools" it is said "exist only in name to carry on a lingering existence. The continuance of these schools is a sheer waste of public money. Well established schools suffer from want of accommodation or equipment and a great deal of money is absorbed by these nominal schools which serve no good purpose." It is also said that the poor attendance is due to the withdrawal of the active intervention of government officials and the local self-government

bodies seem unable to find an adequate substitute for the influence exercised by the revenue officers.

The teacher question is not free from difficulty. The district councils unfortunately confirmed a large number of untrained teachers, with the result that no posts can be found for those who pass through the normal schools, and the yet further result that candidates for normal schools are falling in number.

10. CO-OPERATION.

The co-operative movement has not made such satisfactory progress in these provinces as in some others, and is at present undergoing a process of re-organisation and drastic pruning. It was inaugurated in 1904, and, as in other provinces, experience has to be gathered by the painful process of trial and error. From the start there seems to have been lacking faith and confidence in the ability of the cultivator class to manage their own societies, and in consequence the control was centralised to an extent not usual in India. The Provincial Bank was registered in December 1911 and soon came to occupy too large a part in the movement. The central banks gathered to themselves too much power and the village societies declined to the state of mere agencies, lacking that vigorous individuality which is born of responsibility. The concentration of reserves and fluid resources at the centre afforded opportunity for misunderstanding of the financial position. The considerable increases in the number of societies, from 3,727 in the beginning of 1918-19 to 4,885 at the end of 1919-20, placed a strain upon the financial resources which they were unable to bear. The difficulties were apparent in 1919 and warnings were issued ; in the following year it became clear that the expansion in the number of societies had outstripped the growth of banking credit enjoyed by the provincial and central banks, and the standard of fluid resource fell below that recommended by the Maclagan Committee on Co-operation. By October 1920, in attempting to meet the heavy demands of new societies for extra capital, the Provincial Bank had exhausted its fluid resources held for the protection of the credit organisation as a whole and was no longer able to finance the central banks. The reserve fund had been used in ordinary business and was thus not available to perform its proper function ; severe crop failure and consequent scarcity intensified the crisis and the breakdown of the whole movement was only averted by the grant of government help. This took the form of Rs. 19 lakhs as advances to members of co-operative societies for cultivation expenses, and Rs. 17 lakhs as a guarantee of the cash reserve to promote public confidence in the banks.* The latter served its purpose without being drawn upon to any considerable extent, and in several central banks there was more money offering than could be utilised. Since that date, efforts have been made to subject the whole fabric to detailed critical examination and to remove all elements of weakness. Unfortunately, however, the financial prosperity of the

Vide paragraph 6, Report of the Committee on Co-operative Societies in the Central Provinces, 1922.

provincial and central banks had distracted attention for too long from the internal workings of the village societies. Amongst these latter, sufficient teaching in the principles and objects of co-operation had not been given to members; the principle that the whole movement exists for the benefit of members of the primary societies was not that dominating factor in central bank policy which it ought to have been. The central banks proved unable to devote sufficient attention to the requirements of the village societies and came to regard them as little more than agencies through which their surplus funds could find employment. A series of bad seasons led to the accumulation of arrears of land revenue, rent and *taccavi*, which had to be paid before the instalments of the loans from co-operative banks. The strain proved too much for organisations never strong and never properly trained; many have collapsed and more are moribund. There has been a decrease in the number of societies and members; a large proportion are taking no new loans; nearly one-third are being retained merely for the purpose of securing repayment of old debts. It is expected that nearly 1,200 societies will have to be put into liquidation. The situation is better and the outlook more promising in Berar than in the Central Provinces, and it is hoped that new life may be instilled into the movement through the labours of officials and a devoted band of active and public-spirited gentlemen.

The total number of societies of all kinds, in 1926-27, was 4,124 with a membership of 140,644. Primary credit societies numbered 4,007. With sustained effort, it is hoped to bring more than half of these into a state of efficiency, and, with a hard lesson well-learned, the prospects for the movement should improve.

11. COMMUNICATIONS AND MARKETING.

Of the Central Provinces, it was said in 1861 that "of all the matters under the cognisance of this administration, road-making is the most ultimately important, the most immediately pressing, and yet the most backward. Of roads completely made there is not one." Since then, much progress has been made, more especially since 1900. The length of metalled roads, in 1926, was 4,629 miles, and of all kinds 8,398. A further large programme is in hand and will, it is hoped, prove of great value to the agricultural population. The need for expansion and development is admitted, and in particular some bridges over rivers even on the main lines of communication are still required. Financial considerations and the difficulty in securing local labour restrict progress. In times of acute scarcity, the latter difficulty is overcome, as road-making is often the only means of subsistence.

In 1861, the total milage of railway contemplated was 365 miles; in 1926, 2,535 miles were completed and there is a large programme of new construction urgently wanted for the further development of the province. The enormous benefit to the agriculture of the provinces is indicated by the great expansion of trade with other areas.

Hitherto, agricultural produce has not been brought to market or railhead in any considerable quantity by motors, and the type of road in existence is not suited to heavy lorry traffic. There will thus arise the choice between restricting the use of such lorries and the reconstruction of the main roads on more modern lines.

The cultivator with surplus-produce to sell has usually a choice of methods. He may himself carry it to market or sell it to another cultivator who collects from several neighbours until he has a sufficiently big load. Or he may take it to the village *bania* in lieu of money or grain advanced; then there are itinerant purchasers who move from village to village, generally in the more distant areas, and sell what they have bought in district markets to bigger traders. In tracts of a more advanced character, the grower brings his crops to the big markets on the railway, or to the main central market at Nagpur.

At the big markets, where there is considerable competition, sales and purchases are effected through brokers and commission agents, and although the grower gets a better price he is subjected to a series of charges, each perhaps petty in itself but amounting to an appreciable tax on trade; moreover, he is apt to suffer from unfair deductions on the score of quality, or from a ring of brokers. The interests of the cultivators are not properly represented on the controlling authority, which. on the other hand, is apt to be drawn from the same classes as the brokers and commission agents. In order to secure for the grower a better chance of a fair price, the formation of co-operative sale societies is being attempted.

The Berar markets are better organised, and on paper at least they are well regulated. If the rules could be strictly enforced, the grower would be protected from much of the fraud which is prevalent. But the grower is apt to be ignorant of business methods and leans on the middleman, so that much in practice depends upon the extent to which the latter seeks to serve the cultivator's interest. The custom in some big markets is for the maximum daily rate to be settled by the purchasers, so that the grower is up against a settled fact from the start. In other places, the cotton is auctioned freely from the cart and here the grower usually gets a higher price.

There is considerable diversity about the weights and measures in use, and the grower suffers from his ignorance and from the keener wit of the purchaser. Standardisation, however, presents difficulties which are not easily surmountable.

12. LOCAL SELF-GOVERNMENT.

The Central Provinces and Berar are divided into five divisions, each under a Commissioner, and twenty-two districts each under charge of a Deputy Commissioner. For each district there is a district council (or district board in Berar) constituted originally under the Central Provinces Local Self-Government Act of 1883 and the Berar Rural Boards Law of 1885. A new Act was passed by the old provincial Legislative

Council in 1920, and was applied to Berar in 1922. The new elections are being held under this enactment, and all the districts in the province now have councils constituted under the new Act.

Each district is divided into groups of circles and for each group a local board is established, subject to the authority of the district council. A local board consists of representatives, one or more in number, elected for each circle, together with other persons, not being government officials or exceeding in number one-fourth of the local board, appointed by the Commissioner. The local Government may declare any local board to be an independent one, in which case it exercises within its own area, so far as may be, the functions of a district council. The qualifications vary according to the circumstances of the different parts of the province.

For district councils, the local boards elect from their own number two-thirds of the members prescribed by law; these select one-sixth from amongst persons resident in the district and qualified as voters. The remaining one-sixth are appointed by the Commissioner, and must not be government officials. No official may be a member of a district council unless elected chairman or vice-chairman by that body.

The main source of income is a cess at 6¼ per cent on the land revenue in the Central Provinces, and of 18 pies in the rupee on the assessment of each survey number in Berar. An additional cess may be imposed for educational purposes, and, on occupants of houses, buildings or lands, a special rate may be levied if the village benefits from any school maintained by the council within it. Certain other fees, tolls, taxes, and rates may be imposed. Unless they are indebted to Government, district councils may pass their own budgets; they usually devote their income to roads, hospitals, markets, water works, wells, management of fairs, supervision of sanitation and vaccination, the diffusion of education, and other measures of local utility calculated to promote the health, comfort or convenience of the public.

In important villages or groups of villages, village *panchayats* under the Central Provinces Village Sanitation and Public Management Act, 1920, or the Central Provinces Village Panchayat Act, 1920, may be constituted. The members are elected. Under the former Act, only sanitation is dealt with; under the latter, petty civil and criminal cases may be disposed of. The income is derived from a house tax. Little use has yet been made of these Acts; the Village Sanitation Act has been applied to 114 villages.

In the opinion of the local Government the district councils evince little interest in rural sanitation, veterinary dispensaries, or other rural matters, but lack of funds is ascribed as the reason. The principa object kept in view in framing the new Local Self-Government Act was to extend the functions and increase the sphere of usefulness of district councils by granting to them increased powers of taxation. With the exception of fees and tolls on markets, the councils do not appear to have made any adequate use of these new powers.

13. PUBLIC HEALTH AND SANITATION.

The province possesses the highest birth rate in British India and the second highest death rate. The latter is somewhat lower in rural areas than in towns, but it reflects the general ignorance of the people on sanitary matters. The province as a whole is intensely malarious and fevers account for fifty per cent of the deaths. Malaria is endemic in a very large part of the forest areas (which comprise a considerable proportion of the whole) and is markedly more fatal in rural areas than in urban.

The old Sanitary Board was replaced in 1910 by a Public Health Department with a Director, to which were added later an assistant director and a chief plague medical officer; but, unfortunately, the war and the financial stringency that followed have enforced severe restrictions on activity. There are thirty touring dispensaries under the charge of assistant medical officers, and there are two health publicity officers who tour with magic lanterns and give lectures.

An experiment is being made in the training of vaccinators in epidemiology in order to increase their usefulness and schoolmasters are being taught the technique of vaccination. Owing to the opposition to vaccination against small-pox that still occasionally appears in some areas, Government are considering the advisability of making this measure compulsory.

The touring dispensaries appear to be popular and afford relief to large numbers of sick; the lectures by the publicity officers are well attended and seem to be appreciated by the people. But until more funds are available, progress must be slow. Time is required before any visible effects on the health of the people can be expected. Health officers for the larger districts where the civil surgeons are too busy to do full justice to this part of their duties are needed; but lack of funds is the obstacle. Teachers are being trained in hygiene and use is made of rural schools to inculcate the elements of health.

There is a Village Sanitation Act which is applied to a few villages and funds are collected and spent on cleaning village sites, wells, etc. But no schemes of an extensive nature can be carried out.